Enseignement – Recherche
Sciences & technologies du bois

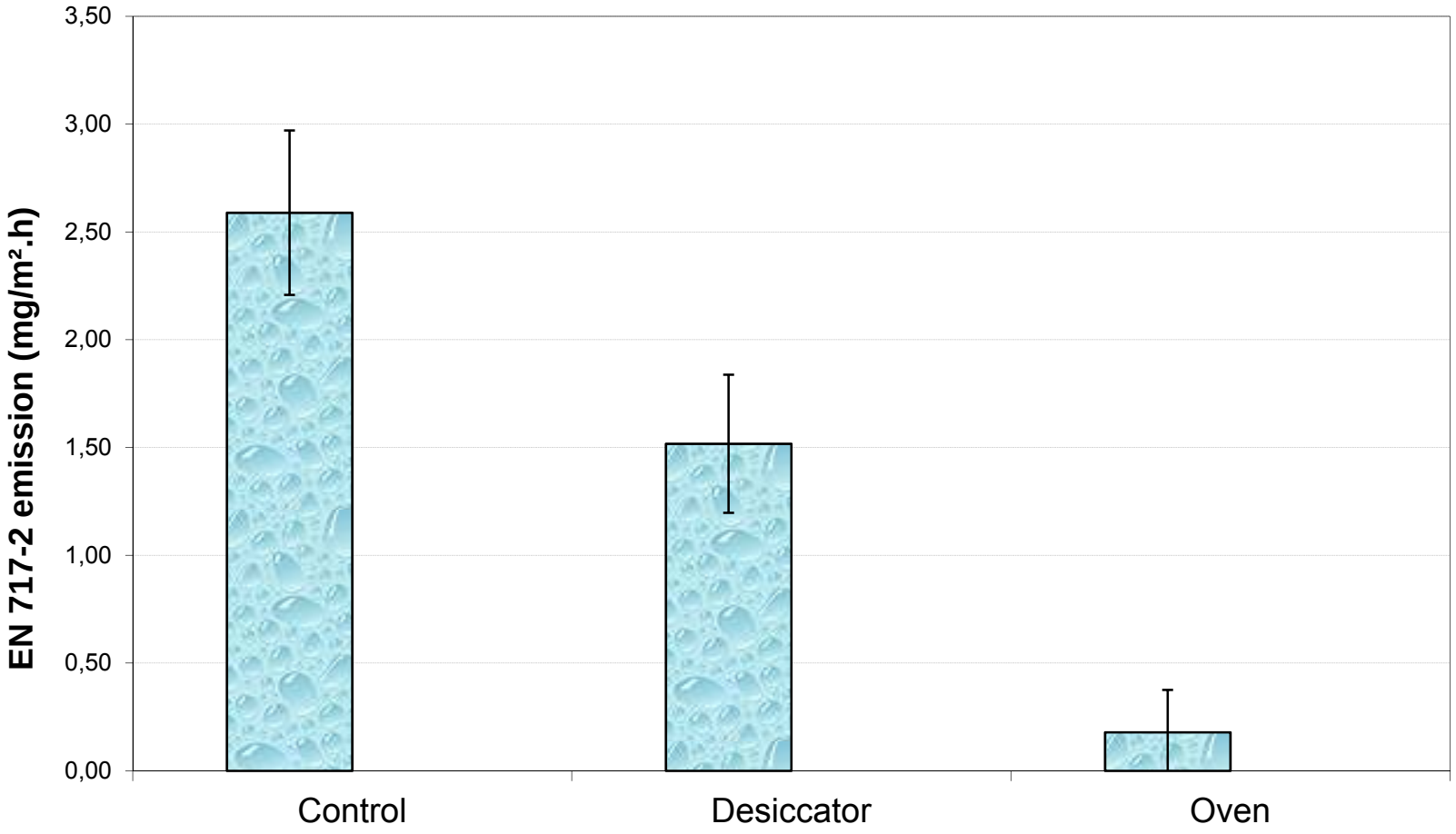
GROUPE ESB

Mark Irle, Christophe Belloncle and Baha Guezguez

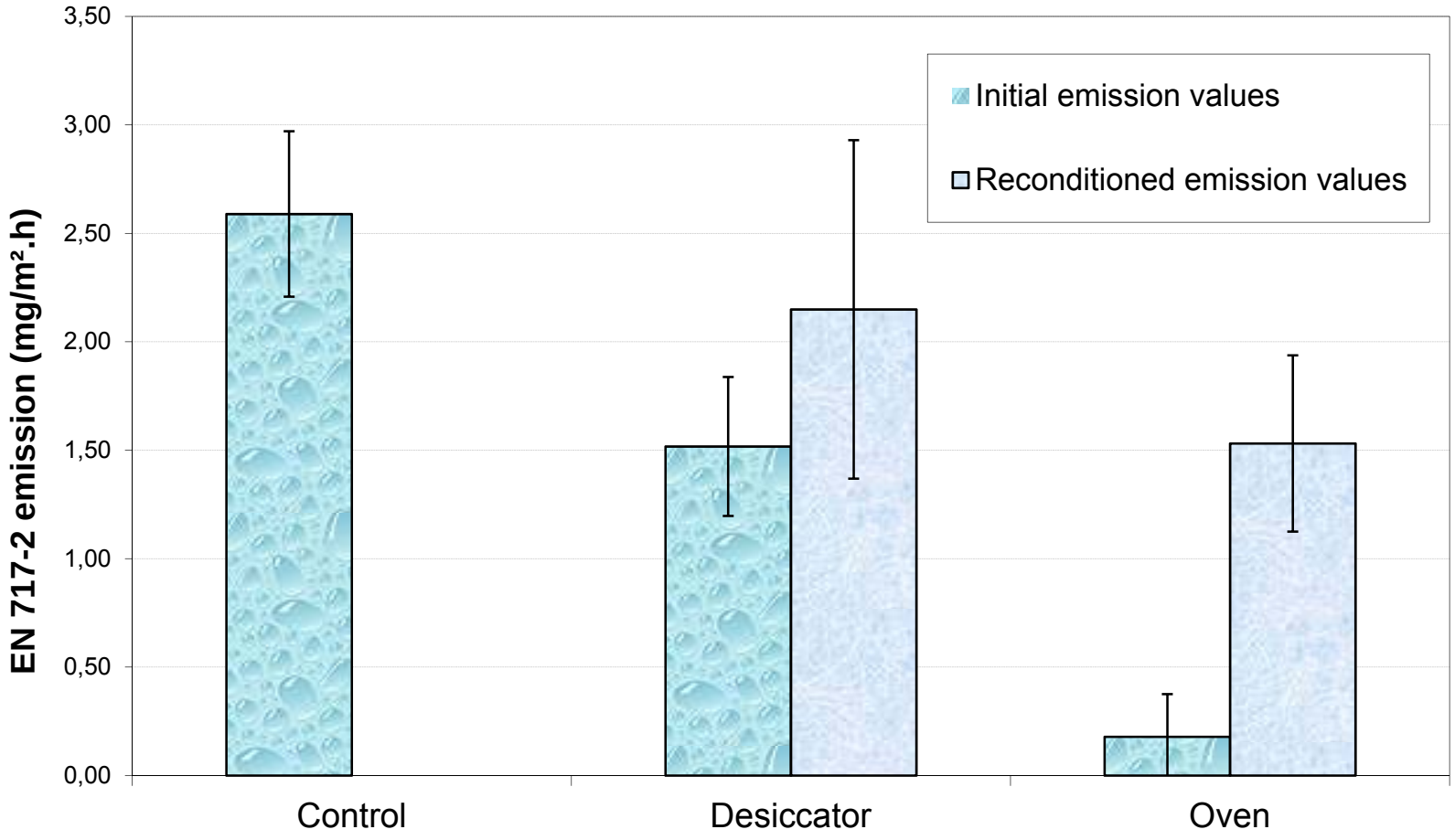
Ecole Supérieure du Bois,
Nantes, France

The influence of humidity on the formaldehyde emissions of wood-based building products

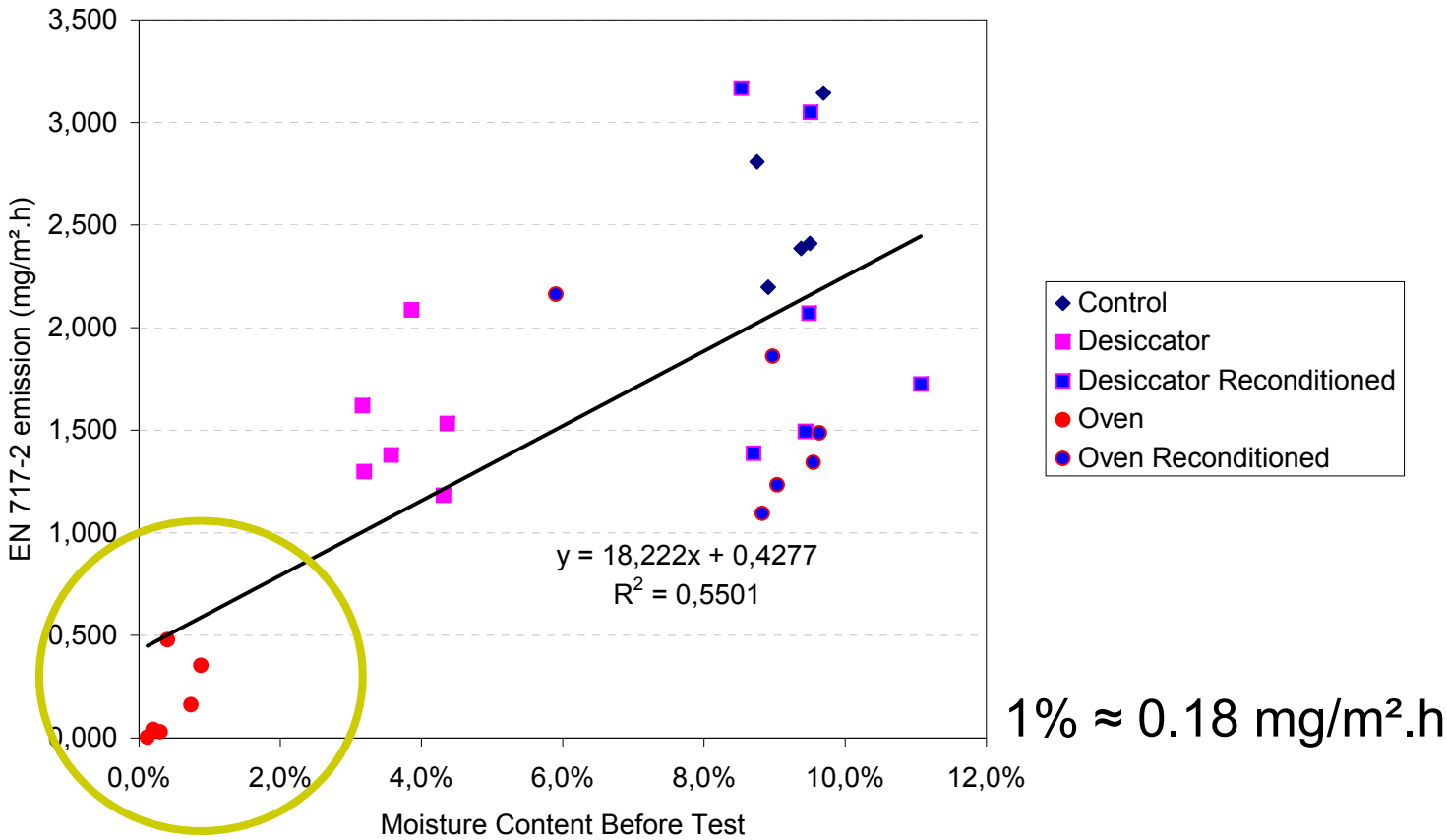
Emission Results E1 Particleboard



All Emission Results



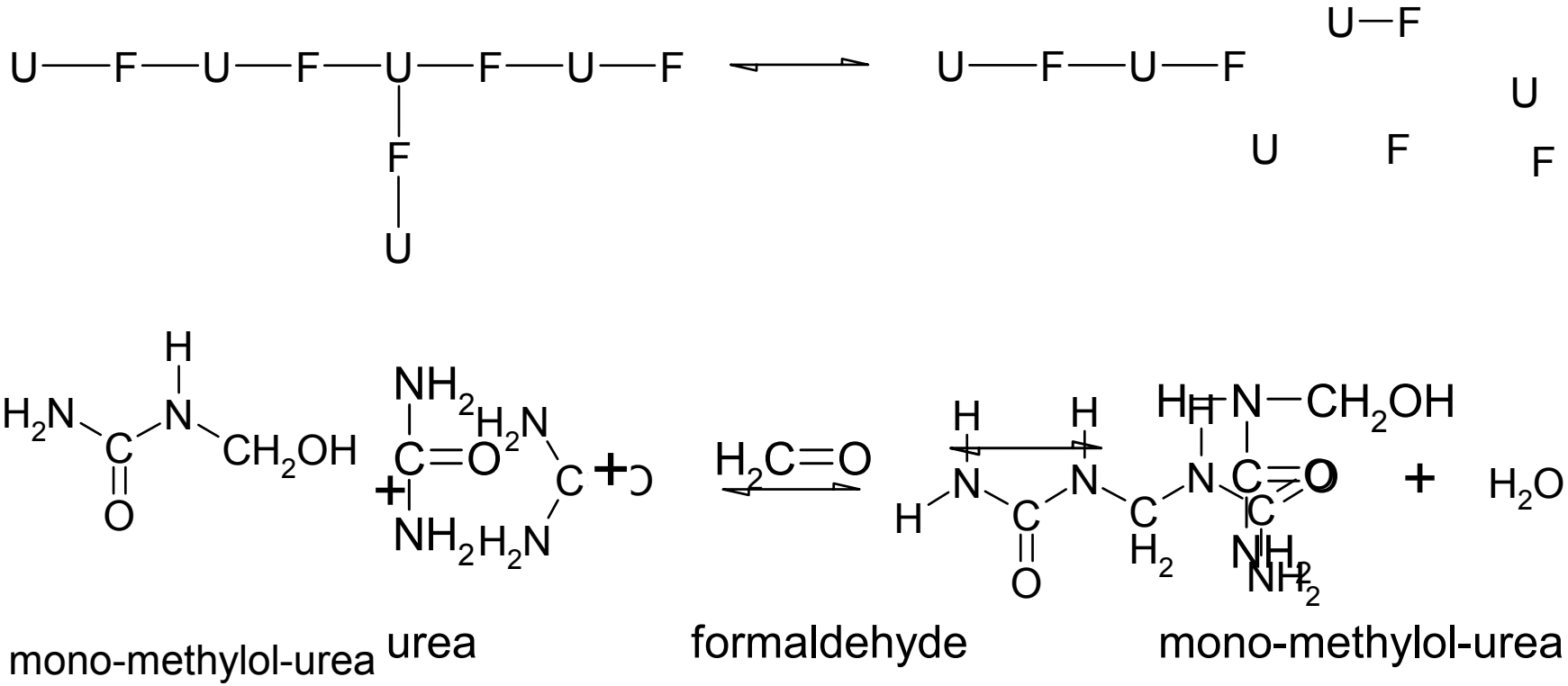
Start MC vs. Emission Correlation (All specimens)



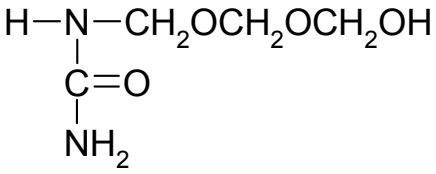
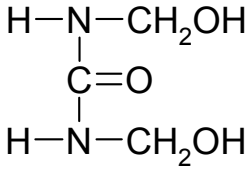
1% ≈ 0.18 mg/m².h

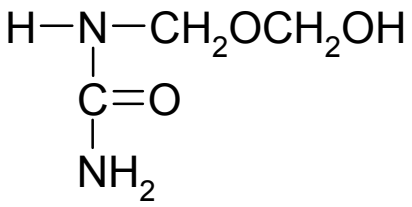
Possible Causes

- No water = no hydrolysis of polymer

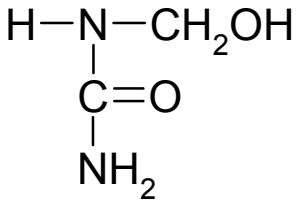


Unstable Formaldehyde Compounds

$HO(CH_2O)_nOH$ paraformaldehyde
$Cellulose{-}O{-}CH_2OH$ hemiacetal
 urea formal
 dimethylolurea



urea hemiformal

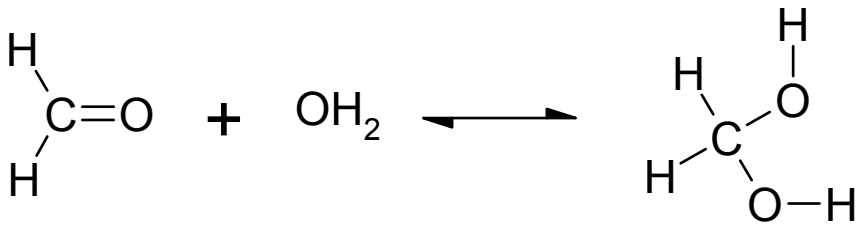


monomethylolurea

No water needed!

Possible Causes

- No water = no hydrolysis of polymer?
- Formaldehyde associated with water
  - very soluble
  - low volatility in aqueous solution
  - forms a hydrate methanediol
  - so may be formaldehyde evaporates with water?
    - no evaporation = no emission?
    - formaldehyde H-bonds to hydroxyls of wood?
    - both?
  - wood MC will determine diffusion rate for formaldehyde

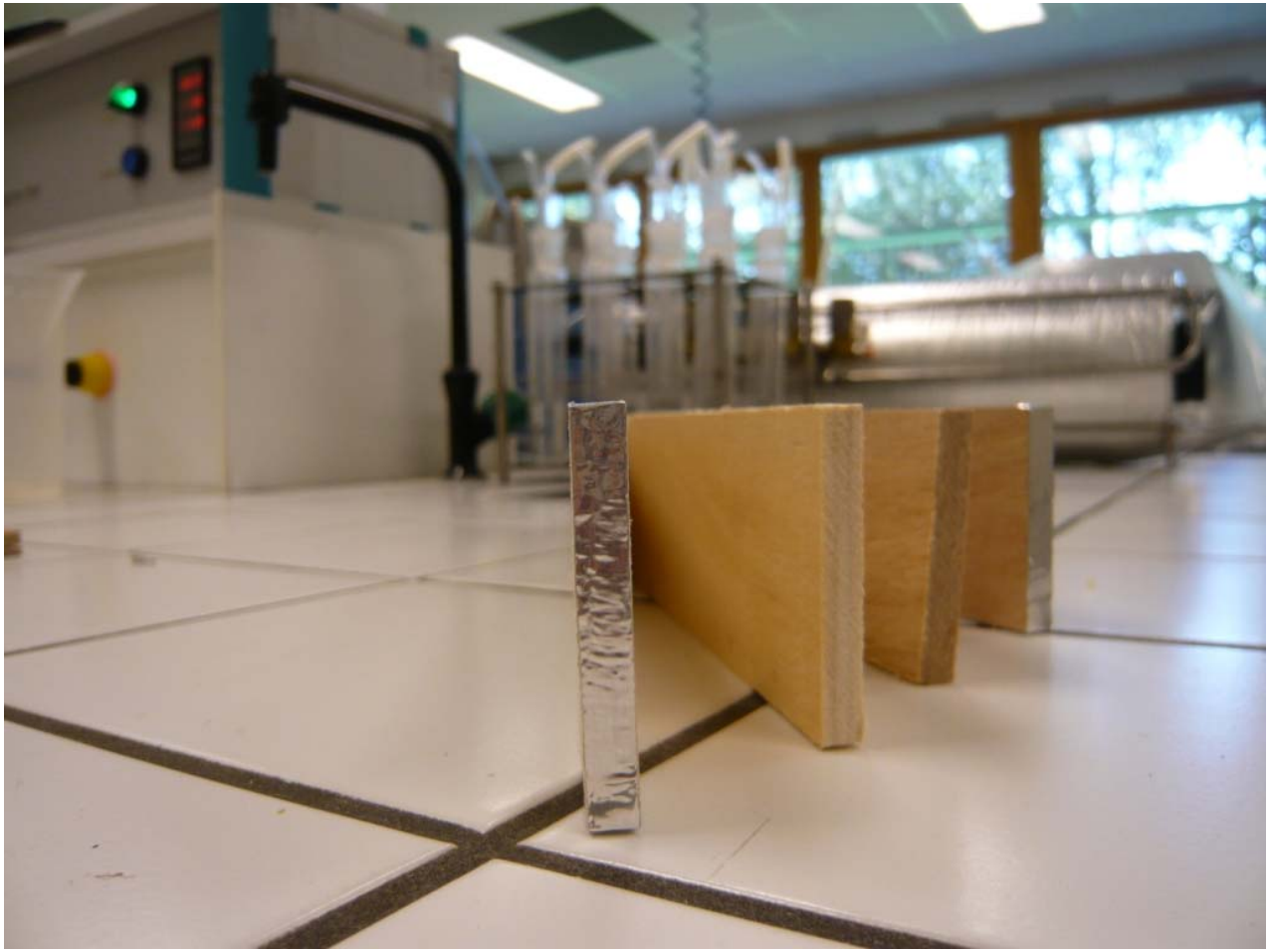


methanediol or
formaldehyde monohydrate
or methylene glycol

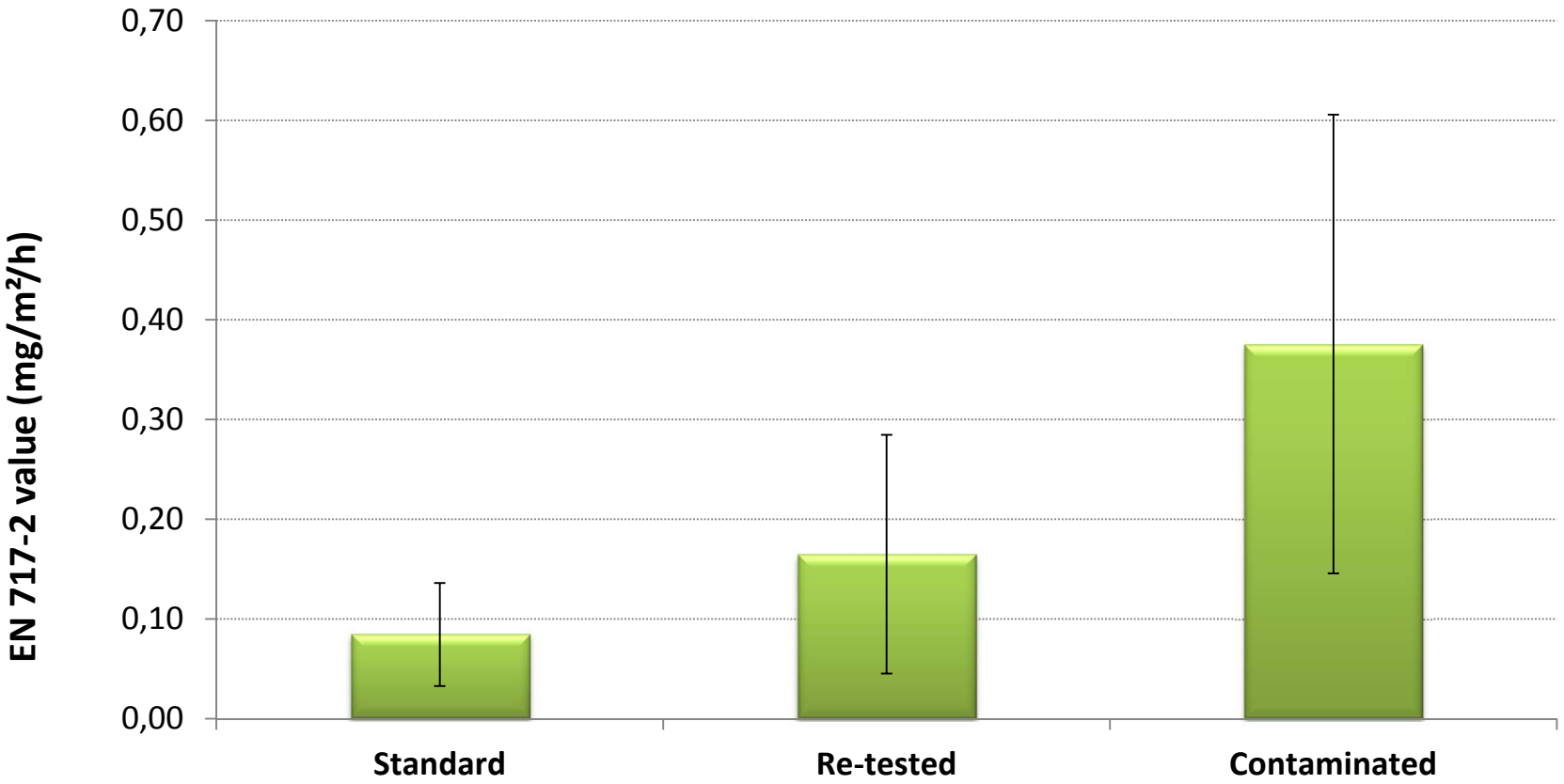
Does wood emit formaldehyde?

- People have said a formaldehyde-free panel is not possible because wood emits formaldehyde
- The word ‘emit’ implies generation of formaldehyde
- Maybe formaldehyde is associated with wood and water in wood
  - helps explain wood’s antiseptic properties?

Pressed Glue-free Plywood



Glueless plywood emission



Conclusions

- Specimen MC affects HCHO emission
- Wood does adsorb HCHO
- Need to determine origin of the formaldehyde
  - promotion of wood products
  - development of better panel products

Contact Details

- Ecole Supérieure du Bois,
  B.P. 10605 - Rue Christian Pauc,
  44306 Nantes Cedex 3,
  France

- Tel: +33 240 18 12 12
- Fax: +33 240 18 12 00

- email: mark.irle@ecoledubois.fr

groupe ESB
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